

# **REMEDIAL INVESTIGATION SAMPLE AND ANALYSIS PLAN**

**San Jacinto River Waste Pits  
Harris County, Texas**

**13 May 2009**

**United States Environmental Protection Agency  
Region VI, Dallas, Texas**

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## LIST OF ACRONYMS

ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
bgs	Below ground surface
BOD	Biological oxygen demand
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action Navy
CLP	Contract laboratory program
COD	Chemical oxygen demand
CP	Command post
CPT	Cone penetrometer
DPT	Direct push technology
DQO	Data quality objective
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FSP	Field sampling plan
GIS	Geographic information system
GPS	Global positioning system
HCl	Hydrochloric acid
HNO <sub>3</sub>	Nitric acid
HSA	Hollow-stem auger
IDL	Instrument detection limits
IDW	Investigation-derived waste
LIF	Laser induced fluorescence
MCAWW	Methods for chemical analysis of water and wastes
MD	Matrix duplicates
MDL	Method detection limit
mg/kg	Milligrams per kilogram
mL	Milliliter
MS	Matrix spike
MSD	Matrix spike duplicate
mV	Millivolt
MW	Monitoring well
NA	Not applicable
ng/kg	Nanogram per kilogram
ng/L	Nanogram per liter
NGVD	National Geodetic Vertical Datum
NIOSH	National Institute for Occupational Safety and Health
NTU	Nephelometric turbidity units
PAH	Polycyclic aromatic hydrocarbons
PCP	Pentachlorophenol
%R	Percent recovery
Pest/PCB	Pesticide/Polychlorinated biphenyl
ppb	Parts per billion
ppm	Parts per million
ppt	Parts per trillion
psi	Pounds per square inch
QA	Quality assurance

QAPP	Quality assurance project plan
QMP	Quality management program
QA/QC	Quality assurance/quality control
QC	Quality control
RAC	Response action contract
RCI	Reactivity, corrosivity, and ignitability
RCRA	Resource Conservation and Recovery Act
RDBMS	Relational database management system
REPA	RCRA Enforcement, Permitting, and Assistance contract
RI/FS	Remedial investigation/feasibility study
RPD	Relative percent difference
SJR	San Jacinto River
SOP	Standard operating procedure
SOW	Scope of work
SRM	Standard reference material
SVOA	Semivolatile organic analysis
SVOC	Semivolatile organic compounds
TCEQ	Texas Commission on Environmental Quality
TCLP	Toxicity characteristic leaching procedure
TDS	Total dissolved solids
TM	Technical memorandum
TOC	Total organic carbon
TOX	Total organic halides
TPWD	Texas Parks and Wildlife Department
TSS	Total suspended solids
USCOE	United States Corps of Engineers
USCS	Unified Soil Classification System
USFWS	United States Fish and Wildlife Service
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
VOA	Volatile organic analysis
VOC	Volatile organic compounds
WAM	Work assignment manager

## 1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) named the San Jacinto River Waste Pits (Site) near Houston, Harris County, Texas to the National Priorities List (NPL) in March 2008. This Sampling and Analysis Plan (SAP) has been prepared to include those items of a typical SAP, as well as incorporating those from a Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HASP). It has been developed in accordance with EPA guidance (EPA, 1988). The plan presents specific sampling locations, equipment and procedures to be used during the Remedial Investigation and Feasibility (RI/FS) for the site, in addition to the underlying rationale.

### 1.1 Site Name

The EPA has referred to the Site as the San Jacinto River Waste Pits.

### 1.2 Site Location

The Site is located on the western bank of the San Jacinto River near the City of Houston, immediately north of the Interstate Highway 10 (IH-10) bridge. The Site occupies a 20.6 acre tract of land currently owned by Virgil C. McGinnes Trustee and is bounded on the south by IH-10, on the east by the San Jacinto River main channel, and on the north and west by shallow water off the River's main channel.

### 1.3 Responsible Agency

The EPA Region VI, Superfund Division, Dallas, Texas will be the lead agency in providing oversight and approval authorities to these RI/FS activities.

### 1.4 Project Organization

### 1.5 Statement of the Specific Problem

The Site, through previous investigations, has been found to have elevated concentrations of dioxins/furans in surface sediments. The uncontrolled release of waste material from the waste pits, currently inundated by the San Jacinto River, has resulted in unacceptable concentrations in sediments and biotic tissues. The spatial extent of contamination and current concentrations in biotic tissues will be the focus of this investigation.

## 2.0 BACKGROUND

### 2.1 Site or Sampling Area Description

### 2.2 Operational History

The site consist a 20.6 acre tract of land currently owned by Virgil C. McGinnes Trustee, including three former on-site disposal pits that are approximately 8.4 acres in total size. These pits historically received wastes from paper mill activities. Currently, the site is inactive, and portions of the three former on-site disposal pits are underwater in the San Jacinto River.

### 2.3 Previous Investigations and Regulatory Involvement

The Texas Parks & Wildlife Department (TPWD) referred the San Jacinto River Waste Pits site to the Texas Commission on Environmental Quality (TCEQ) on April 14, 2005. The Site was proposed to the NPL on September 17, 2007 and received a final listing date of March 19, 2008. The EPA is in the process of investigating parties associated with the site who may be liable for the costs of remedying the release or threat of release of hazardous substances. (Appendix A) A list of previous investigations is provided in Table 2-1.

### 2.4 Geological Setting

### 2.5 Potential Source Areas

There are currently two primary source areas to be investigated. The first, referred to as the northern impoundment, consists of the 20.6 acre tract of land currently owned by Virgil C. McGinnes Trustee, including three former on-site disposal pits that are approximately 8.4 acres in total size. The second, referred to as the southern impoundment, consists a former upland waste pit south of IH-10.

### 2.6 Conceptual Site Model

The primary and secondary sources, exposure pathways, and receptors are presented in the conceptual site model (Figure 2-4).

#### 2.6.1 Primary and Secondary Sources

#### 2.6.2 Exposure Pathways

### 2.6.3 Receptors

## 2.5 Environmental and/or Human Impact

The primary hazardous substances that have been documented at the Site are polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans. Samples collected in the disposal pits and in the San Jacinto River have dioxin concentrations as high as 70,000 parts per trillion (ppt). Fish tissue samples have been collected by the TPWD, and dioxin has been found in both fish and crab tissue samples above a health based benchmark.

Sediment, water, and tissue samples collected in the vicinity of the impoundments show elevated levels of dioxins. A consumption advisory based on dioxin is in place on this segment of the watershed. The current advisory recommends that adults eat no more than one meal per month caught from the advisory area, and suggests that women of childbearing age and children not consume any blue crabs or fish from the advisory area.

## 3.0 PROJECT DATA QUALITY OBJECTIVES

### 3.1 Project Task and Problem Definition

### 3.2 Data Quality Objectives (DQOs)

### 3.3 Data Quality Indicators (DQIs)

This section describes how QA objectives for precision, accuracy, completeness, and sensitivity are measured, calculated, and reported. For some investigations, additional equations might be needed (for example, equations for calculating mass balances, emission rates, and confidence ranges).

#### 3.3.1 Precision

The precision of many analyses is assessed by comparing analytical results of MS/MSD sample pairs for organic analyses, field duplicate samples, field split samples, laboratory duplicate samples, and replicate measurements. If it is calculated from two measurements, precision is normally expressed as RPD, as in the following equations:

$$RPD = \frac{(C_1 - C_2) \times 100}{(C_1 + C_2)/2}$$

where: RPD = relative percent difference  
 $C_1$  = larger of the two observed measurement values  
 $C_2$  = smaller of the two observed measurement values

$$RSD = (s/\bar{x}) \times 100\%$$

where: RSD = relative standard deviation  
 $s$  = standard deviation  
 $\bar{x}$  = the mean or replicate analyses

Standard deviation ( $s$ ) is defined as follows:

$$s = \sqrt{\frac{\sum_{i=1}^n (y_i - \bar{y})^2}{n - 1}}$$

where:  $s$  = standard deviation  
 $y_i$  = measured value of the  $i$ th replicate  
 $\bar{y}$  = mean or replicate measurement  
 $n$  = number of replicates

For field measurements such as pH, where the absolute variation is more appropriate, precision is often reported as the absolute range ( $D$ ) of duplicate measurements:

$$D = \frac{1}{2}m_1 - m_2^{1/2}$$

where:  $D$  = absolute range  
 $m_1$  = first measurement value  
 $m_2$  = second measurement value

### 3.3.2 Accuracy

The accuracy of many analytical methods is assessed by using the results of MS/MSD samples for organic analysis, MS samples for inorganic analysis, surrogate spike samples, laboratory control samples, standard reference materials, independent check standards, and measurements of instrument responses against zero and span gases. For measurements in which spikes are used, %R is often calculated as a measure of accuracy as follows:

$$\%R = 100 \times \left[ \frac{(S - U)}{C_{sa}} \right]$$

where: %R = percent recovery  
 $S$  = measured concentration in spiked aliquot  
 $U$  = measured concentration in unspiked aliquot (usually equals zero for surrogate spikes)  
 $C_{sa}$  = actual concentration of spike added

When a standard reference material is used, the following equation is often used to calculate %R:

$$\% R = 100 \times \left[ \frac{C_m}{C_{srm}} \right]$$

where: %R = percent recovery  
 $C_m$  = measured concentration of standard reference material  
 $C_{srm}$  = actual concentration of standard reference material

For field measurements such as pH, accuracy is often expressed in terms of bias and is calculated as follows:

$$B = M - A$$

where: B = bias  
M = measured value of standard reference material (SRM)  
A = actual value of SRM

### 3.3.3 Completeness

For most measurements, completeness is calculated as follows:

$$\% C = 100\% \left[ \frac{V}{n} \right]$$

where: %C = percent completeness  
V = actual number of measurements judged valid (the validity of a measurement result is determined by judging its suitability for its intended use)  
n = total number of measurements planned to achieve a specified level of confidence in decision making

### 3.3.4 Sensitivity

The achievement of MDLs depends on instrument sensitivity and matrix effects. Therefore, it is important to monitor instrument sensitivity to ensure data quality and to ensure that analyses meet the QA objectives established for sensitivity in the project-specific QAPP. Method sensitivity is typically evaluated in terms of the MDL and, for many measurements, is calculated as follows:

$$MDL = t_{(n-1, \alpha=0.99)} \cdot s$$

where: MDL = method detection limit  
s = standard deviation of the replicate analyses  
 $t_{(n-1, 1-\alpha=0.99)}$  = student's t-value for a one-sided 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom  
n = number of measurements  
 $\alpha$  = statistical significance level

### 3.4 Data Review and Validation

Unless otherwise directed by EPA, 10 percent of the analytical data will be validated to ensure that the confirmatory data are accurate and defensible. As part of the data validation process, the electronic data deliverables will be reviewed against the hard copy deliverables to ensure accurate transfer of data. In addition, the hard copy will be evaluated for errors in calculation of results. After the data validation, qualifiers can be placed on the data to indicate the usability of the data. These qualifiers will be placed into the electronic data file. When the data set with the appropriate data qualifiers has been approved, the electronic data will be released to the project manager for reporting.

### 3.5 Data Management

Data for this project will be obtained from a combination of sources, including field measurements, field analysis, and subcontracted laboratories. The process of data gathering is a coordination effort and will be conducted by project staff in conjunction with all potential data producers. The data will be obtained from the analytical service provider, when appropriate, in the form of an electronic data deliverable, in addition to the required hard copy analytical data package. Data will be formally verified (or validated) before presentation of associated results or their use in subsequent activities.

Data tracking is imperative to ensure timely, cost-effective, and high-quality results. Data tracking begins with sample chain of custody. When the analytical services provider receives custody of the samples, the provider will send a sample acknowledgment to EPA. The sample acknowledgment will confirm sample receipt, condition, and required analyses. The tracking program will contain all pertinent information about each sample and can track the data at each phase of the process. The tracking program carries the data through completion of data validation.

The database is intended to support the RI/FS decision-making process, land reuse, public disclosure needs, and archive requirements. The use of the system will facilitate the evaluation, understanding, and communication of environmental concerns at the Site.

The Site data will be formatted for entry into a relational database management system (RDBMS) and a geographic information system (GIS). Spatial information pertaining to Site roads, buildings, and topographical contours will be developed in a GIS. EPA will also develop other spatial data gathered, including monitoring well, soil boring, sediment, surface water, and biological locations, in a GIS. The spatial data can be linked to a relational database that stores information associated with the spatial data. This information is called attribute data. When available spatial data are linked to attribute data, including analytical results derived from sample collection points, a clear picture of the Site can be developed.

As a part of the final report QC review procedures, the data will be checked again by technical reviewers and a QC coordinator to verify its accuracy in the report. In addition to the final report, all analytical data in the form obtained from the analytical services provider will be archived with the final project file in the document control center. The document control center will house all final project files until they are transferred to EPA.

### **3.6 Assessment Oversight**

## 4.0 SAMPLING RATIONALE

The computer model, Visual Sampling Plan (VSP Version 5.3, Battelle Memorial Institute, 2008) was used to calculate the number of samples per matrix and their geo-spatial location. The output for this model is presented in **Appendix B**.

The inputs to the VSP program were a consensus among stakeholders. For sediments and soil, the lower bound of the gray region was set at the 10<sup>th</sup> percentile of the TMDL data (1.6 ppt TEQ). The action level was set at the 90<sup>th</sup> percentile of the TMDL data (77.4 ppt TEQ). The 10% and 90% levels were selected as a range to incorporate the majority of the TMDL sediment data. Ten percent of the measured concentrations fell below 1.6 ng/kg TEQ and 90% fell below 77.4 ng/kg TEQ. This was done for purposes of defining statistical parameters for choosing a sufficient number of samples for the sampling plan. This range is not risk-based, rather, the range was selected to provide confidence that most of the concentrations sampled during this effort may exist surrounding the site. The alpha level was set at 5% and beta 10%. The standard deviation for sediments was based on TMDL samples within the preliminary perimeter of this investigation. For soils, the standard deviation was estimated at half that of sediment due to the lack of historical data sufficient to calculate a standard deviation. A simple random design with adaptive fill was selected and the impoundment area was stratified to account for anticipated differences in COPC distribution in this area.

### 4.1 Soil Sampling

Soil in the vicinity of the former waste pits may have been contaminated through a number of physical mechanisms including runoff and leaching which result in sorption to exposed soil particles. Soil in the former impoundment areas had direct contact with the primary source while the surrounding upland areas may have been impacted by indirect contact. The purpose of the soil sampling is to determine the nature and extent of site contamination to soil within the preliminary sampling perimeter.

### 4.2 Sediment Sampling

Sediment serves as a secondary source of Site contaminants when it has been exposed to the primary source through direct contact (in the submerged portions of the waste pits) and through indirect means of re-suspension and settling of adsorbed COPCs.

COPCs in sediments are most likely to be concentrated in fine-grained sediments with high organic matter content. These types of sediments are the last to settle from suspension and are typically deposited in areas of lowest flow velocity or in areas of ponded water. The primary consideration in sample site selection is to choose an area of quiescent settling with low hydrologic activity or energy, and to evaluate these areas as potential sources of contaminants. Examples of quiescent areas associated with surface water bodies include 1) inside bends of channels, 2) backwater areas or side channels, and 3) areas of shoaling and deposition. The selection of a sampling location can greatly influence the analytical results.

The primary limiting factor in the collection of sediment samples is the thickness of the recent fine-grained sediment overlying the sediments. The thickness of recent fine-grained sediments may be limited, even in areas of low hydrologic activity due to scouring of the drainage channels by ship traffic and other activities in the River.

Sediment samples will be collected from those areas of the site that appear to provide suitable habitat for ecological receptors. The critical decision for these areas is “Has there been a release from the Site that can impact ecological or human receptors?” The decision statement for this investigation unit has been derived:

Determine whether COPC concentrations in sediments exceed site-specific risk-based human health or ecological criteria and warrant additional investigations or a response action, or whether the COPC concentrations are equal to or less than site-specific risk-based human health or ecological criteria and the sediments require No Further Action.

### 4.3 Water Sampling

#### 4.3.1 Surface Water

Surface water is exposed to the primary source of Site contaminants through runoff and deposition. Portions of the former waste pits are submerged in the San Jacinto River. Surface water in the river is also subject to inputs from contaminated soil and sediments. Surface water samples will be collected from the San Jacinto River. The critical decision for this media is “Has there been a release from the Site that can impact ecological or human receptors?” One decision statement for this investigation unit has been derived:

Determine whether COC concentrations in surface water exceed site-specific risk-based human health or ecological criteria and warrant additional investigation or a response action, or whether the COC concentrations are equal to or less than site-specific risk-based human health or ecological criteria and the surface water require No Further Action.

#### 4.3.2 Groundwater

Groundwater in contact with contaminated waste within the impoundments may come to be contaminated. This contaminated groundwater could pose a secondary source for human and ecological exposure if it were to migrate and daylight or up-well in down-gradient sediments.

## 4.4 Biological Sampling

Biota may be exposed to Site contaminants through a number of exposure pathways identified in the conceptual site models (Appendix XX). Bioaccumulative contaminants pose a significant risk to biota since they are stored and accumulate within the tissues of exposed organisms. Site specific tissue data is useful in assessing food chain exposure to the COPCs since it provides a realistic measure of exposure to higher trophic level organisms. Biological tissues (fish and shellfish) are a relevant (complete and significant) source of exposure to both humans and ecological receptors through the ingestion pathway. The existing fishing advisories for dioxin in the San Jacinto River further justify collection of this data in the initial phase of investigation.

### 4.4.1 Human Health

Recreational use of the Site and surrounding area is common. Therefore human exposure via ingestion of contaminated tissues could pose risk to health. As a result, it has been decided to evaluate this exposure pathway by collecting and analyzing tissues from upper trophic level fish (red drum, spotted sea trout, or southern flounder) and benthic macroinvertebrates (blue crab).

For this investigation, fish from upper trophic levels (red drum and spotted sea trout) will be targeted for collection and tissue analysis. Ten (10) samples per investigative area (Site and Reference) will be targeted for collection. These ten samples should be from fish of legal recreational size limit, and of the same species. Fillets will be analyzed for percent lipids, dioxins/furans and PCBs.

Blue crabs will be targeted for collection and tissue analysis. Ten (10) samples per investigative area (Site and Reference) will be targeted for collection. Each sample will be a composite of edible muscle tissues from 15 crabs meeting the legal recreational size limit. Tissues will be analyzed for percent lipids, dioxins/furans and PCBs.

### 4.4.2 Ecological

Bioaccumulative contaminants pose a significant risk to biota since they are stored and accumulate within the tissues of exposed organisms. Effects of such exposure are typically chronic and expressed via measures for growth and reproduction. This exposure pathway will be evaluated by collecting forage fish (less than 6 inches) and benthic macroinvertebrates (small blue crab).

Forage fish such as striped mullet, gizzard shad, sheepshead minnow, and mummichug will be targeted for collection and analysis. Ten (10) samples per investigative area (Site and Reference) will be targeted for collection. Each sample will be a composite of not less than 5 individual fish (so as to meet analytical sample mass requirements) from a single species. Whole-body tissues will be analyzed for percent lipids, dioxins/furans and PCBs.

Undersized (less than legal limit) blue crabs will be targeted for collection and analysis. Ten (10) samples per investigative area (Site and Reference) will be targeted for collection. Each sample will be a composite of not less than 5 individual crabs (so as to meet analytical sample mass requirements). Whole-body tissues will be analyzed for percent lipids, dioxins/furans and PCBs.

## 5.0 REQUEST FOR ANALYSES

### 5.1 Analyses Narrative

## 6.0 FIELD METHODS AND PROCEDURES

Sections 6.1 through 6.6 describe the activities for investigating and characterizing the environmental condition of the Site and surrounding area. EPA will accomplish the field investigation using a combination of EPA personnel, RAC contractor personnel, and personnel from various State and federal personnel. EPA will implement and oversee all field activities, sample management, and laboratory analyses. The schedule for field activities is presented in Section 7.7.

The sampling equipment and procedures described are based on the following field activities:

- Mobilization
- Site and area reconnaissance
- Sampling activities
- Demobilization
- Characterization and disposal of investigation-derived waste (IDW)

The EPA standard operating procedures (SOP) used for conducting these activities are listed in Table 6-1 and presented in Appendix C. The following sections provide a detailed description of proposed field investigation activities.

Sampling activities consist of the following:

- Geophysical methods to confirm presence or absence of clay confining unit
- Surface and subsurface soil sampling to determine nature and extent of contamination and risk
- Surface and subsurface sediment sampling to determine nature and extent of contamination and risk
- Surface water sampling to determine nature and extent of contamination and risk
- Biota sampling to determine risk to receptor ingestion
- Temporary monitoring well installation and discrete-interval ground water sampling
- Permanent monitoring well installation with ground water sampling
- Aquifer testing to determine hydraulic parameters of aquifer

## 6.1 Field Equipment

This section outlines testing, inspection, and maintenance procedures for field equipment and instruments and for laboratory instruments. It is anticipated that field equipment will be leased. This section discusses general requirements applicable to field and laboratory equipment, in addition to field-specific and laboratory-specific requirements.

Testing, inspection, and maintenance methods and frequency will be based on (1) the type of instrument; (2) its stability characteristics; (3) the required accuracy, sensitivity, and precision; (4) its intended use, considering project-specific DQOs; (5) manufacturer's recommendations; and (6) other conditions affecting measurement or operational control. For most instruments, preventive maintenance is performed in accordance with procedures and schedules recommended in (1) the instrument manufacturer's literature or operating manual, or (2) SOPs associated with particular applications of the instrument.

In some cases, testing, inspection, and maintenance procedures and schedules will differ from the manufacturer's specifications or SOPs. Procedures or schedules can differ, for example, when a field instrument is used to make critical measurements or when the analytical methods associated with a laboratory instrument require more frequent testing, inspection, and maintenance.

### 6.1.1 List of Equipment Needed

The list of expected field equipment can be found in **Table 6-2**.

### 6.1.2 Calibration of Field Equipment

**EPA** will use leased field equipment and instruments. Leased field equipment and instruments will be uniquely identified as the property of equipment supplier. Field equipment and instruments will be thoroughly checked and calibrated before shipment or transport to the field. The supplier is responsible for checking the equipment that it leases. Copies of testing, inspection, and maintenance procedures will be shipped to the field with the equipment and instruments. Once in the field, **EPA** field team leaders assume responsibility for testing, inspection, and maintenance.

After arrival in the field, field equipment and instruments will be inspected for damage. Damaged equipment and instruments will be replaced or repaired immediately. Battery-operated equipment is checked to assure full operating capacity; if needed, batteries are recharged or replaced. Critical spare parts—such as tape, paper, pH probes, electrodes, and batteries—will be kept on site to minimize equipment downtime. To prevent delays in the field schedule, backup instruments and equipment will be available on site or within a 1-day shipping period.

Equipment used to collect field samples or take field measurements will be maintained and calibrated with sufficient frequency and in such a manner that the accuracy and reproducibility of results are consistent with the manufacturer's specifications and with project-specific DQOs. The manufacturer's operating manual and instructions that accompany the equipment will be consulted to ensure that all calibration procedures are followed. The SOPs listed in **Table 6-1** describe calibration procedures, frequency, standards, control limits, and corrective actions.

Following use, field equipment will be properly decontaminated before being returned to its source. When the equipment is returned, copies of any field notes regarding equipment problems will be included so that problems are not overlooked and any necessary equipment repairs are carried out.

## 6.2 Soil

Soil samples will be collected from a minimum depth of 6 inches bgs using hand augering, stainless-steel trowels or Geoprobe technology (southern impoundment). Hand auger borings will be installed using stainless-steel augers. Soil samples will be continuously collected from the borings at 0 to 0.5 for all samples and; 0.5 to 2, 2 to 4, and 4-6-foot intervals within the impoundments. The soil from each sampling interval will be homogenized in a stainless-steel mixing bowl using a stainless-steel trowel or spoon.

The collected soil samples will be logged in accordance with the Unified Soil Classification System (USCS). A soil boring log will be completed for each boring. After the completion of sampling at each boring location, the boring will be grouted to the ground surface with a cement-bentonite mix.

All reusable equipment used to collect, handle, or measure samples will be decontaminated. The decontamination procedure will match the degree of contamination on the sampling equipment. Equipment will be decontaminated at the designated decontamination area for each sampling team. All items that will come in contact with potentially contaminated media will be decontaminated before use. If decontaminated sampling equipment is not used immediately, it will be covered with plastic. All decontamination episodes and deviations from decontamination procedures will be recorded in the designated field logbook. The general decontamination procedures for equipment include washing all sampling devices with Alconox™ and water to remove dirt, thoroughly rinsing them with tap water, and then rinsing them with deionized water.

### 6.2.1 Surface Soil Sampling

Hand augers or stainless-steel trowels will be used to collect surface soil (0 to 6 inches bgs). Vegetative debris will be cleared of the sample location prior to sample collection. Surface soil will be placed in a stainless-steel bowl and homogenized prior to placement in appropriate sample container(s).

### 6.2.2 Subsurface Soil Sampling

For the Geoprobe method, the Geoprobe sample rods will be advanced by hydraulically pushing or driving the rods to the desired sample collection depth. Soil samples will be collected at each sampling location using a Macro-core sampling device to maximize sample volume. The Macro-core sampler collects a soil core in a nonreactive plastic or acetate liner 4 feet long and 1.5 inches in diameter. The following general sampling procedures will be used, which may be modified at the site depending on actual site conditions.

- Drive the Geoprobe tube, lined with a clear, acetate sleeve, to 6 feet bgs. Mobilize the Geoprobe to the next sample location and repeat the procedure. Once a set number of the push tubes have been filled, transport the samples back to the command post (CP). Drop off samples, decontaminate used push tubes, and return to the Geoprobe with clean push tubes. Move the Geoprobe to the next sampling location. This methodology may be modified if such restrictions as property access, vegetation, or topographical features arise.
- Used stainless-steel push tubes and associated equipment will be decontaminated using a steam cleaner and Liquinox, followed by clean water and final deionized water rinses. Decontamination water will be drummed as IDW until it has been properly characterized for disposal.
- At the CP, use a permanent marker to label the exterior of the acetate sleeve with the survey station number. Measure and mark 0 to 0.5, 0.5 to 2, 2 to 4 and 4 to 6 foot bgs intervals along the acetate sleeve beginning at ground surface. If too many samples begin to accumulate at the CP, some of these tasks may be conducted at each sampling location by the Geoprobe operator.
- Cut the acetate sleeve into sections with a hacksaw or knife, using the interval markings as a guide. Place each intact section into a 2-gallon resealable bag, then seal and label the bag. Label each bag with the sample number, which includes the sample medium, survey station number, and associated depth interval. These sample numbers will be noted on the boring logs, in the field logbook, and on the chain-of-custody forms if a sample aliquot is collected for off-site laboratory analysis. Store and chill the sample to 4°C in an ice chest.

### 6.3 Sediment Sampling

Two primary considerations for the selection of sampling equipment and procedures for the collection of sediment samples include:

Depth of water overlying the sediment substrate; and

Physical characteristics and thickness of sediment to be sampled.

In addition, analytical requirements will necessitate specific sampling equipment and procedures at certain sample locations.

For water depths less than approximately 2 feet (approximately knee-high) and with a relatively level bottom, the preferred method of accessing the sample locations will be to wade into the water body. Sample collection can then be conducted in accordance with the most appropriate sediment sampling technique that will include using a dredge (ponar or Eckman) or a push core.

Water depths greater than approximately 2 feet increase the difficulty of manipulating sampling equipment and sample handling. These water depths will require a stable platform above the water surface from which the sediment sampling can be conducted. Suitable platforms will consist of a sampling boat, floating sample barge, or floating pier. Sample collection from one of these platforms can then be conducted in accordance with the most appropriate sediment sampling technique that will include using a sediment dredge (ponar or Eckman) or using a push core. It is anticipated that water depths in the center of the river will necessitate the collection of sediment samples using some type of stable platform.

The sediments will be transferred into a stainless-steel bowl, homogenized, and transferred into the appropriate sample container(s).

## 6.4 Water Sampling

### 6.4.1 Surface Water Sampling

Surface water samples will be collected at mid-depth at each selected location. A peristaltic pump and teflon® tubing will be used to draw the water directly into the sample containers. Care will be taken to avoid undue sediment disturbance prior to and during the collection of the sample. A new length of tubing will be used for each location. Store and chill the sample to 4°C in an ice chest. A multi-probe water quality meter will be used to collect standard water quality data (pH, temperature, conductivity, redox, and dissolved oxygen) at each sample location.

### 6.4.2 Groundwater Sampling

#### 6.4.2.1 Water-Level Measurements

The water level in the well and the depth to the bottom of the well will be measured using a electronic water-level probe. To determine the height of water in the well casing, the depth to water value will be subtracted from the total well depth, measured from the notch made in the top of the north side of the well casing during surveying.

#### 6.4.2.2 Purging

The existing and newly installed temporary monitoring wells will be purged of three casing volumes or until the temperature, pH, specific conductivity, and turbidity readings have stabilized. Purging will continue until these parameters stabilize (less than 0.2 pH units, 10 NTUs, or a 10 percent change for the other parameters between three consecutive readings, or until the well is purged dry).

A peristaltic pump and teflon® tubing will be used to draw the water directly into the sample containers. The tubing will be lowered to the approximate depth where the lateral ground water inflow is the highest, and purging will be conducted at a flow rate lower than the well recharge rate. The purge rate will approximate the natural ground water flow rate. Purging at too high a rate can result in the redevelopment of the well and increased turbidity. The following is a summary of the purging methods:

- All measuring, purging, and sampling equipment that enters the monitoring well will first be decontaminated. Dedicated tubing will be used for each well sampled during this investigation.
- The water level in the well and the depth to the bottom of the well will be measured using a electronic water-level probe. To determine the height of water in the well casing, the depth to water value will be subtracted from the total well depth, measured from the notch made in the top of the north side of the well casing during surveying. The total casing volume in gallons will be calculated using the formula:

$$CV = 3.14 \cdot WCR^2 \cdot H_w \cdot 7.48$$

where,

CV	=	Well casing volume (gallons)
WCR	=	Well casing radius (feet)
H <sub>w</sub>	=	Water height (feet)
7.48	=	Conversion factor (gallons/cubic feet)

All calculations will be recorded in the designated logbook.

- The purge rate should be adjusted to achieve minimal drawdown. If the water level appears to be dropping too much, the pumping rate will be lowered to avoid further drawdown. Purging will continue until the measured field parameters are stable, three well casing volumes have been purged, or the well is purged dry. If three casing volumes have been purged without achieving stabilization, a final reading will be recorded, the sample will be collected, and the field logbook will note that sample collection began after three well casing volumes were purged.
- Temperature, pH, specific conductivity, dissolved oxygen, and turbidity will be measured during purging. These water quality field measurements will be collected at the start of purging and then at a minimum of five times for each casing volume removed. Purging will continue until the field parameters have stabilized (less than 10 NTU, less than 1°C, and less than 0.1 pH units change for three consecutive readings). If the parameters have not stabilized after 3 hours, purging will cease.
- Information concerning well purging will be recorded on Well Purge Logs (Appendix ?). All purge water will be contained for proper treatment and disposal, as designated in Section 8.0 of this SAP.

#### **6.4.2.3 Well Sampling**

The monitoring wells will be sampled after all well development parameters have stabilized. The monitoring wells will be sampled following the purging using low-flow sampling. Sampling will be performed immediately following purging. Sampling information will be recorded in the designated field logbook.

### **6.5 Biological Sampling**

Whole body and fillet tissues will be collected for carnivorous fish and whole body and muscle tissues will be collected for blue crabs. Fish and shellfish collected should include both adult and juvenile organisms collected throughout the entire preliminary sampling perimeter and reference area. Ten samples will be targeted for collection for both fish (fillet and whole body) and blue crab (muscle and whole body) tissues per investigative area (Site and Reference).

Biota will be analyzed for percent lipids, dioxins/furans and PCBs.

#### **6.5.1 Benthic Macroinvertebrates**

Baited, wire crab traps will be placed throughout the investigative areas and checked daily. Crabs meeting the DQOs will be transported back to the staging area for measurements and packaging.

#### **6.5.2 Fish**

A combination of collection methods will be employed to catch fish. Larger fish (for human health consumption evaluation) will be sampled via gill nets and/or hook and line techniques. Smaller forage fish will be collected by a number of methods that could include: seines, gill nets, cast nets, and minnow traps.

## 7.0 SAMPLE CONTAINERS, PRESERVATION AND STORAGE

Tables 7-1 through 7-5 specify the required sample volume, container type, preservation technique, and holding time for each analysis to be conducted on each sample matrix to be analyzed by all required methods. The tables cover aqueous and solid (soil, sediment, biota) sample matrices, and includes information for organic, inorganic, and general chemistry parameters in each matrix. Required containers, preservation techniques, and holding times for field QC samples (such as duplicates, field blanks, trip blanks, and matrix spike/matrix spike duplicates [MS/MSD]) will typically be the same as for investigative samples.

## 8.0 DISPOSAL OF INVESTIGATION-DERIVED WASTE

EPA will manage and track all waste materials generated during the investigation activities. The wastes will include discarded materials resulting from field activities (such as sampling, drilling, and decontamination processes) that, in their present form, possess no inherent value or additional usefulness without treatment. The wastes will be divided into soil, water, and personal protective equipment (PPE). It is anticipated that a minimum amount of soil IDW will be generated due to the collection of nearly all the soil from each hand auger boring.

To ensure the appropriate disposal of IDW, a tracking system will document the information necessary to determine the amount of contamination present in the waste. Waste tracking will be performed by the EPA field manager and includes the following: segregation by waste type, waste container labeling, waste container movement, waste container storage, and waste disposal.

EPA and its contractors will contain all soil cutting in 55-gallon drums located on site near each sampling location. All disposable PPE, including Tyvek™ coveralls, gloves, and booties will be decontaminated and disposed of as nonhazardous waste or will be contained in 55-gallon drums and left on site for later disposition.

Soil and water waste will be characterized and disposed of in accordance with local, state, and federal regulations. If the soil waste is nonhazardous, it will be disposed of at a nonhazardous landfill. If analytical data demonstrate that any soil waste can be classified as hazardous, disposal options will be evaluated by EPA. EPA will approve the final treatment or disposal location of any aqueous waste generated.

## 9.0 SAMPLE DOCUMENTATION AND SHIPMENT

EPA will identify each sampling location using a unique alphanumeric designation, which incorporates the following information:

- Site name (SJWP for San Jacinto Waste Pits)
- Sample matrix
  - SS for surface or subsurface soil sample
  - SD for sediment
  - SW for surface water samples
  - GW for ground water samples
  - T for biota tissue
- Area of the site, as identified by the letters A, B, C, D, or E
  - “A” will be used for locations within the preliminary perimeter, not identified as an impoundment or primary source area
  - “B” will be used for locations within the northern impoundment source area
  - “C” will be used for locations within the southern impoundment source area
  - “D” will be used for locations outside of the preliminary perimeter, not to include the reference area(s), i.e. fingerprint locations
  - “E” will be used for reference locations
- Sampling point number within each area
  - Each sampling point will be unique.
- Sampling depth (in inches)
  - For example, a subsurface soil sample collected from the first boring in Area C, at a depth of 48 inches, would have the following sample designation:  
SJWPSS-C01-48

Each sample collected will be traceable from the point of collection through analysis and final disposition to ensure sample integrity. Sample integrity helps to ensure the legal defensibility of the analytical data and subsequent conclusions. The team will use standard EPA procedures to identify, track, monitor, and maintain chain of custody for all samples. These procedures include the following:

- Field chain-of-custody procedures
  - Field procedures
  - Field logbooks
- Laboratory chain-of-custody procedures

Samples will be labeled accordingly, placed inside a bubble-wrap bag, double ziplock bag, and over-packed into a 52 quart cooler. Double-bagged ice will be placed into the coolers, along with a temperature blank, to ensure samples arrive at the laboratory at the designated preservation temperature. Each cooler will contain a copy of the chain-of-custody. Coolers will then receive a custody seal and be taped with packing tape to ensure the integrity of the container.

## 10.0 QUALITY CONTROL

Various types of field and laboratory QC samples and measurements will be used to verify that analytical data meet the QA objectives. Field QC samples and measurements will be used to assess how sampling activities and measurements influence data quality. Similarly, laboratory QC samples will be used to assess how a laboratory's analytical program influences data quality. This section describes the QC samples to be analyzed during the investigation for (1) each field and laboratory environmental measurement method, and (2) each sample matrix type. Table ?? presents the frequency of QC samples to be collected.

This section provides definitions and typical collection and analysis frequencies of common field and laboratory QC samples and measurements. It also outlines the procedures used to assess field measurements, laboratory data, and common data quality indicators.

### 10.1 Field Quality Control

Field QC samples will be collected and analyzed to assess the quality of data generated by sampling activities. These samples may include trip blanks, field blanks, equipment rinsate blanks, field duplicates, and MS/MSD samples (MS/MSD samples are laboratory QC samples that may require extra sample volumes to be collected in the field) (Table ??). Field QC measurements may include field replicate measurements and checks of instrument responses against QC standards.

Trip blanks are used to assess the potential for sample contamination during handling, shipment, and storage. Trip blanks are sample bottles filled with organic-free water. The trip blanks are sealed and transported to the field; kept with empty sample bottles, and then with the investigative samples, throughout the field effort; and returned to the laboratory with the investigative samples for analysis. Trip blanks are never opened in the field. One trip blank is included within every shipping cooler of aqueous samples to be analyzed for VOCs. The trip blank is analyzed for total VOCs.

Field blanks are collected to determine the potential contamination of field samples from ambient conditions. Field blanks are required for aqueous sample matrices and consist of analyte-free (degassed organic-free) water for VOC analysis. Field blanks are generally not required for solid matrices but may be collected on a case-by-case basis. Typically, one field blank is collected for each group of aqueous samples per each day of sampling.

Equipment rinsate blanks are collected when sampling equipment is used to place samples into containers. These blanks assess the cleanliness of the sampling equipment and the effectiveness of equipment decontamination. Equipment rinsate blanks are collected by pouring analyte-free water over the surfaces of sampling equipment that contacts sampling media. Equipment rinsate blanks are collected after sampling equipment has been decontaminated but before the equipment is reused for sampling. Equipment rinsate blanks are typically collected at a frequency of one for every 20 or fewer samples and are analyzed for all total analyses (but not for toxicity characteristic leaching procedure [TCLP] analyses). Equipment rinsate blanks are not required when disposable or dedicated sampling equipment is used.

Field duplicate samples are independent samples collected as close as possible, in space and time, to the original investigative sample. Immediately after the original sample is collected, the field duplicate sample is collected using the same collection method. Care is taken to collect the field duplicate sample as close as possible to the location of the original sample. Field duplicate samples can measure the influence of sampling and field procedures on the precision of an environmental measurement. They can also provide information on the heterogeneity of a sampling location. Typically, field duplicates are collected at a frequency of 1 for every 20 investigative samples of the same matrix type and are analyzed for the sample analytes as the original sample.

MS/MSD samples are typically collected for use as laboratory QC samples for analysis by organic methods. Solid MS/MSD samples and liquid nonaqueous samples for total analysis require no extra volume. Solids and liquid nonaqueous samples for organic TCLP analysis require three times the normal sample amount. Aqueous samples are collected from one sampling location at triple the normal sample volume for all organic analyses. In the laboratory, MS/MSD samples are split and two portions are spiked with known amounts of analytes. Analytical results for MS/MSD samples are used to measure the precision and accuracy of the laboratory organic analytical program.

MS/matrix duplicates (MD) samples are typically collected for use as laboratory QC samples for analysis by inorganic and general chemistry methods. MS/MD samples (solid, nonaqueous liquid, and aqueous liquid) are collected from one location at double the normal sample volume. In the laboratory, MS/MD samples are split and only one portion is spiked with known amounts of analytes. Analytical results for MS samples are used to measure the accuracy of the laboratory inorganic and general chemistry analytical programs, and results for MD samples are used to measure the precision of the inorganic and general chemistry analytical programs. Each of these QC samples is typically collected and analyzed at a frequency of one for every 20 investigative samples per matrix.

QC checks for field measurements will consist mainly of initial and continuing calibration checks of field equipment. When applicable, QC check standards independent of the calibration standards will be used to check equipment performance. For example, to check the accuracy of field equipment such as a pH meter, a standard buffer solution, independent of the calibration standards, may be used. Precision of field measurements will usually be checked by taking replicate measurements. The types and frequencies of field QC measurements and the QC limits for these measurements will be as specified in EPA-approved methods listed in **Table ??**

## 10.2 Laboratory Quality Control

All laboratories that perform analytical work under this project must adhere to a QA program that is used to monitor and control all laboratory QC activities. Each laboratory must have a written QA manual that describes the QA program in detail. The laboratory QA manager is responsible for ensuring that all laboratory internal QC checks are conducted in accordance with the analytical method requirements and the laboratory's QA manual. Many of the laboratory QC procedures and requirements are described in EPA-approved analytical methods, laboratory method SOPs, and method guidance documents. However, if laboratory QC requirements are not specified in an analytical method, or requirements beyond those included in an analytical method are necessary to ensure that project QA objectives and DQOs are met, EPA will request that the following information be included in the data package:

- Laboratory analytical methods to which the internal QC check applies
- Complete procedures for conducting the internal QC check
- QC samples and QC measurements involved in the internal QC check
- Complete collection and preparation procedures for the QC samples
- Spiking analytes and concentrations
- Control limits for the internal QC check
- Corrective action procedures to be followed if the internal QC check is not carried out properly or results are outside control limits

Laboratory QC procedures and requirements may include the preparation and analysis of laboratory control samples, method blanks, MS and MS/MSDs, MD samples, surrogate spikes, and standard reference materials or independent check standards. The following subsections discuss QC checks that are most frequently required.

### 10.2.1 Laboratory Control Samples

Laboratory control samples are well-characterized, laboratory-generated samples that will be used to monitor the laboratory's day-to-day performance of analytical methods. Laboratory control samples can include laboratory duplicate samples, surrogate spikes, and method blanks. The results of laboratory control sample analysis are compared to well-defined laboratory control limits to determine whether the laboratory system is in control for the method. If the system is not in control, corrective action will be implemented. Appropriate corrective actions include (1) stopping the analysis; (2) examining instrument performance or sample preparation and analysis information; and (3) determining whether samples should be reprepared or reanalyzed.

### 10.2.2 Method Blanks

Method blanks, which are also known as analytical process or preparation blanks, are analyzed to assess the level of background interference or contamination in the analytical system and the level that may cause the laboratory to report elevated concentration levels or false-positive data. Typically, one method blank is analyzed for every 20 samples processed by the analytical system. For batches smaller than 20 samples, one method blank is analyzed with every batch of samples processed.

A method blank consists of reagents specific to the analytical method that are carried through every aspect of the analytical procedure, including sample preparation, cleanup, and analysis. The results of the method blank analysis are evaluated in conjunction with other QC information to determine the acceptability of the data generated for that batch of samples. Ideally, the concentration of target analytes in the method blank should be below the reporting limit for that analyte. For some common laboratory contaminants, a higher concentration may be allowed.

If the blank for any analysis is beyond control limits, the source of contamination must be investigated, and appropriate corrective action must be taken and documented. Investigation includes an evaluation of the data to determine the extent of the contamination and its effect on sample results. If a method blank is within control limits but indicates concentrations of analytes that are above the reporting limit, an investigation should be conducted to determine whether any corrective action could eliminate an ongoing source of target analytes.

For organic analyses, the concentrations of target analytes in the method blank must be below the reporting limit for that analyte for the blank to be considered acceptable. An exception may be made for common laboratory contaminants (such as methylene chloride, acetone, 2-butanone, and phthalate esters) that may be present in the blank at up to five times the reporting limit. These compounds are frequently detected at low levels in method blanks and result from materials used in collecting, preparing, and analyzing samples for organic parameters.

Reporting limits for metals and wet chemistry analyses are typically near instrument detection limits (IDL), and the concentration of the target analytes in the blank must be below the reporting limit. If the blank value for a target analyte is below the reporting limit, the analyte is reported with no data qualifier flag on the associated sampling data. If the blank value is between the reporting limit and two times the reporting limit, the analyte in the associated samples is reported with a data qualifier flag to indicate that contamination was present in the blank or that the sample may be reprepared and reanalyzed if project objectives require this action. A blank containing concentrations of an analyte or analytes that are above two times the reporting limit is considered unacceptable unless (1) the lowest concentration of the analyte in the associated samples is at least 10 times the blank concentration, or (2) the concentrations of the analyte in all samples associated with the blank are below the reporting limit.

### 10.2.3 Matrix Spikes and Matrix Spike Duplicates

An MS is an environmental sample to which known concentrations of all target analytes have been added. The MS is used to evaluate the effect of the sample matrix on the accuracy of both organic and inorganic analyses. Large numbers of target analytes are divided into two to three spike standard solutions. Each spike standard solution must be used alternately. The MS, in addition to an unspiked aliquot, is taken through the entire analytical procedure, and the recovery of the analytes is calculated. Results are expressed as percent recovery (%R).

For organic analyses, an MS/MSD is an environmental sample that is divided into two separate aliquots, each of which is spiked with known concentrations of target analytes. The two spiked aliquots, in addition to an unspiked sample aliquot, are analyzed separately, and the results are compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results are expressed as RPD and %R, and are compared to control limits that have been established for each analyte. If results fall outside control limits, corrective action must be taken. Typically, one MS/MSD is analyzed for every 20 investigative samples that are prepared in one batch. For inorganic analyses, an MD is used to evaluate precision.

### 10.2.4 Matrix Duplicates

The MD is used to evaluate the effect of the sample matrix on the precision of inorganic analyses. The MD is often referred to as a laboratory duplicate to differentiate it from field duplicates. The laboratory prepares two aliquots of the same sample without the addition of spiking compounds. The MD, in addition to the original sample aliquot, is taken through the entire analytical procedure, and the relative percent difference (RPD) of the duplicate results is calculated. Results are expressed as RPD, and are compared to control limits that have been established for each analyte. If results fall outside control limits, corrective action must be performed. Typically, one MD is analyzed for every 20 investigative samples that are prepared in one batch.

### 10.2.5 Surrogate Spikes

Surrogates are organic compounds that are similar to the analytes of interest in chemical behavior but are not normally found in environmental samples. Surrogates are added to samples before the samples are extracted to assess the efficiency of the extraction procedure and bias introduced by the sample matrix. Results are reported in terms of %R. Individual analytical methods may dictate sample reanalysis on the basis of surrogate criteria.

The laboratory will use surrogate recoveries mainly to assess the overall efficiency in implementing the method. Obvious problems with sample preparation and analysis (such as evaporation to dryness or a leaking septum) that can lead to poor surrogate spike recoveries must be eliminated before low surrogate recoveries are attributed to matrix effects.

## 11.0 FIELD VARIANCES

All field variances will be approved by the EPA project manager, either verbally or in writing. This approval will be recorded and maintained. Those variances that could affect the overall scope of the investigation may require a meeting of the stakeholders prior to the granting of approval.

## 12.0 FIELD HEALTH AND SAFETY PROCEDURES

## 13.0 REFERENCES